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Victory in Europe

Unlike the armistice which saw the end of the last war, VE-Day came as no surprise. The *wehrmacht* has been well and truly beaten. The Navies, Armies and Air Forces of the Allies have by much sacrifice and sheer hard work gained complete ascendancy over their enemies. Supporting these efforts was the dull, unceasing, arduous toil of industry, kept in motion and supplied with essential raw materials by thousands of foundries located in and thousands of miles away from the front line. Several London foundries have become total casualties, whilst others still carry their first-aid bandages.

It is fitting that we should pay a high tribute to the directors, managers, foremen and operatives of Britain's basic industry for the almost superhuman effort they have made towards making this victory possible. Long hours in ill-ventilated Zep-lighted foundries, prolonged by duties as home guards, fire watchers or wardens, made heavy calls on their endurance. Not a few were unable to withstand the strain and their loss is mourned alongside with the Service casualties. Yet despite the calls of work and auxiliary war work, the urge for improving technical knowledge seems to have been stimulated. We were flattered—not insulted—when during lecture engagements two or three members of the audience failed to keep awake. They were equalled in stature by the sentry in Drinkwater's play, "Abraham Lincoln." Again, other meetings have been but slightly disturbed but not dispersed by the nerve-wracking crescendo of an approaching rocket or the crash of a high-explosive bomb.

Now this same group of individuals has to face up to this brave new world. Already disagreements as to future policy have disrupted directorates, and caused prominent executives to hand in their resignations. It is easily understandable, as too close association for too long a time under conditions of excessive pressure of work tends to widen differences of opinion. Normally, a short holiday provides the necessary healing balm. However, a short game of industrial "musical chairs" may be beneficial in the change-over period.

What of the foundry industry of Germany? It is obvious that the major installations of Berlin, Hamburg, Cologne, and the other great cities are ruined, but of all industries, the jobbing foundry is possibly the easiest and quickest to re-equip. From the *débris* one can salvage a cupola here, a sand mill there, a crane and some ladles elsewhere. Herein will be the rebirth of German industry, and if the occupation authorities are wise they will control the economic future of Germany by a strict supervision of the order-books of such concerns. Without castings there can be no rehabilitation of the metallurgical and chemical industries, whilst the growth of others can be controlled.

"British Industry and Commerce: Its History and Reconstruction." A select bibliography published by the Sheffield City Libraries. Price 6d., post free. This extraordinarily well chosen list of books and pamphlets catalogues all the important contributions to this fascinating subject from Smiles' "Lives of the Engineers" to the "squabble" between Lord Trent and Lord McGowan on the patents system and licences. Here, indeed, is the key to all the ammunition needed for the budding politician, but there is so much to digest that it will take a few years' hard reading before complete assimilation is achieved.

THE AMERICAN PRODUCTION of malleable-iron castings during 1944 increased slightly to 889,820 short tons from 849,764 tons in the preceding year and shows a substantial gain over the 768,496 tons produced in 1942, according to data compiled by the Bureau of Census, Department of Commerce.

Contents

Victory in Europe, 23.—Notes from the Branches, 24.—New Catalogue, 24.—A.F.A. Awards, 24.—Wider Use of Light Metals, 24.—Costs in a Jobbing Foundry, 25.—Lighting Up of New Blast Furnace, 30.—Soil Corrosion: Resistance of Ferrous and Non-Ferrous Materials, 30.—Bearing Developments, 31.—Increased Activity of the London Branch, 36.—Moulding Box Maintenance, 37.—News in Brief, 38.—Kent Alloys, Limited, 38.—Personal, 40.—Youth and Industry, 40.—Company Results, 42.—Obituary, 42.—Contracts Open, 42.—Raw Material Markets, 44.

NOTES FROM THE BRANCHES

NEWCASTLE-UPON-TYNE.—A most successful session was concluded on April 28, when the annual general meeting was held. Following the usual business routine, including the election of officers, the retiring branch-president, Mr. E. B. Ellis, expressed his gratification of the rapid progress made by the branch during the session, and said it was with confidence that he would hand over to his successor, Mr. T. B. Burrows, in the sure knowledge that the branch was going to greater strength before the session 1945-1946. He dwelt briefly upon the meetings which had been held since September last, and expressed thanks to the lecturers who had so willingly travelled to Newcastle under inconvenient conditions to give their services. Thanks were also publicly expressed to Jarrow Metal Industries, Limited, for their kindness in permitting members to visit their works in January. Mr. Ellis emphasised that despite the execrable weather on the day chosen for this visit, 75 per cent. of the members took part, many of them travelling long distances.

The secretarial report was presented, and this proved without doubt that a new enthusiasm had become most pronounced. The branch secretary compared the 1939 membership numbers with those of the present day, and gave a summary of newly elected members as follows:—Subscribing firms, 7; members, 6; associate members, 20; associates, 8; students, 1, making a total of 42, while a number of additional proposal forms had been received for submission to the general council at their next meeting. Mr. Ellis reminded the meeting that he had promised three prizes to junior members for essays on the visit to Jarrow Metal Industries, Limited. The prizewinners were, first Mr. E. Bramwell, second Mr. J. H. Stirk, and third Mr. J. Colwell. Technical books and tools chosen by the prizewinners would be available at an early date. He commented on the excellent observation shown by the members, who had submitted essays which showed that they had gone on a visit to obtain knowledge and not on a mere sight-seeing tour.

Mr. T. B. Burrows, in proposing a vote of thanks to Mr. Ellis for his work during the war, said that he had held a most difficult office, and it was very largely due to his hard work that the branch had so quickly regained its former strength. Mr. G. Elston seconded and members heartily concurred. The branch-secretary was cordially thanked for his work. The meeting concluded with the exhibition of two sound films kindly loaned by the Ministry of Supply.

NEW CATALOGUE

Self-lubricating Wheels. A leaflet received from B. F. Collingridge, Limited, of Belvedere Works, Feltham, Middlesex, illustrates and describes a wheel suitable for fitting to wood or steel barrows, which is said to be self-lubricating for a period of five years. This is attained by creating at the hub of the wheel an annular space loaded with grease and free moving balls. Such a system obviously has interest for most foundries.

A.F.A. AWARDS

For distinctive contributions in the field of cast metals, the Board of Awards of the American Foundrymen's Association recently awarded gold medals and honorary life memberships in the Association to five outstanding leaders of the foundry field. Those honoured, and the accompanying citations, are as follow:—

To Mr. Robert E. Kennedy, secretary, American Foundrymen's Association, the Joseph S. Seaman Gold Medal of the A.F.A. "for outstanding meritorious service to all branches of the foundry industry through his work in organising and guiding the development of technical and operating Papers and discussions, and his untiring encouragement to all A.F.A. chapters, committees and members."

To Mr. C. E. Sims, supervising metallurgist, Battelle Memorial Institute, Columbus, Ohio, the John A. Penton Gold Medal of the A.F.A. "because of his outstanding contribution to the steel casting industry."

To Mr. M. J. Gregory, retired, honorary life membership in the A.F.A. "for his contribution to the association and the foundry industry."

To Rear Admiral A. H. Van Keuren, U.S.N., Director, Naval Research Laboratory, Anacostia, D.C., honorary life membership in the A.F.A. "in recognition of his efforts in behalf of the foundry industry."

Honorary life memberships in the A.F.A. were also awarded to Mr. Ralph J. Teetor, president, Cadillac Malleable Iron Company, Cadillac, Mich., president of the American Foundrymen's Association, 1944-45, and to Mr. R. E. Kennedy and Mr. C. E. Sims, the 1945 medallists.

WIDER USE OF LIGHT METALS

Mr. Henry J. Kaiser, in a statement before the U.S. Senate's Small Business Committee, anticipated a wide post-war use of the two light metals, magnesium and aluminium, not only in the building of aircraft, but in naval construction, terminal facilities, lorry bodies and buses. He told the Committee that negotiations for the building of a destroyer wholly of aluminium had been completed the day before the Japanese attack on Pearl Harbour, but plans were deferred because of the paramount need of aluminium for aircraft. The aluminium destroyer would have been capable of travelling at 60 knots and of turning on a very short radius. Some day it would be built, and if expectations were correct, many of the fighting ships now in service in the navies of the world might be rendered obsolete.

AMERICAN GREY AND MALLEABLE IRON FOUNDRIES are permitted to carry a 30-day stock of pig-iron and a 60-day supply of scrap, the latter to include forthcoming back scrap.

THE MINISTRY OF FUEL AND POWER, through its Committee on the Efficient Use of Fuel, has published a 12-page pamphlet (Fuel Efficiency Bulletin No. 39) on "Water Treatment." It is free of charge from the Regional Offices of the Ministry.

COSTS IN A JOBBING FOUNDRY*

Details based on the Author's own experiences

By H. E. E. HOLLADAY, B.Sc.

In considering costing systems in a foundry it always seems advisable to remember one or two factors which govern any system. In the first place, accuracy of the recording of time on jobs is usually dependent on the honesty of the workpeople or the foreman, and most foundrymen know of cases where, when a waster has been made, the management has been kept in the dark by the judicious charging of time "to Repairs to Cupola," "Mixing Sand," "Fetching Boxes," etc. Another point to remember is that, whilst the improvement in accuracy of a costing system is always desirable, a sense of proportion should be retained to see that the accuracy of the system is not out of all proportion to the accuracy of the figures it uses, and that the cost of producing that accuracy is not so great that it more than absorbs any saving, or increase in profits, which it might achieve.

This Paper is not an attempt to lay down any definite laws on foundry costings, but rather to give some account of the experience gained through having to overhaul two foundries where the costing systems were archaic . . . and of the conclusions reached, which it is hoped may be of some benefit to others.

Foundry work may be very roughly divided into three categories:—(1) Foundry work involving large jobs where the labour on each casting is considerable and can, therefore, be easily allocated; (2) foundry work where the castings are almost entirely of the same type, such as in a foundry specialising in one line of business, *e.g.*, municipal castings, stove and grate castings, or rainwater goods; and (3) purely jobbing foundries and others, where the work varies considerably and is, in the main, in small quantities of a large number of different types of castings.

Heavy Jobbing Shops

The first foundry investigated entered into category (1). The original method of costing, if it could be called such, was to charge the moulding, coremaking and fettling times direct to the particular job. All the unproductive labour not chargeable to jobs, and the sundries, such as coal dust, sand, etc., were merely lumped in with the general overheads of the firm. Once a year the amount of scrap, pig and coke and the furnacemen's wages were collected and divided by the total weight of good castings made—thus a price per cwt. was obtained. This was used as the cost for the materials for the ensuing twelve months, with rough adjustments for any change in prices. A percentage was added to the total cost of materials plus labour to cover the overheads and sundry materials, etc., not already included.

This method was gradually improved and eventually it worked on these lines. The time of the coremakers and moulders was charged as before, being considered productive labour. A cost sheet was worked out each week, on to which was charged the amount of scrap, pig, coke and labour involved in casting, also the furnace labour for that period. The distribution of the cost of the sundries was made by keeping a record of the total cost of these items each year and so much allocated to the cost sheet each week in £ s. d., with a slight variation, at the discretion of the operator, in

Job N°	N°	CASTING	CWT	QRS	LBS	£	s	d
4548	1	GEAR WHEEL 11 ST	31	1	—	11	10	—
4812	10	FIREBARS	2	2	20	—	19	8
4750	4	BRACKET 33 T	1	—	12	—	8	1
4651	1	BEDPLATE	17	2	21	6	9	11
4521	1	JUNCTION	3	1	10	1	4	6
4711	1	DRU	9	3	—	3	11	7
4727	5	COVERS	1	1	—	—	9	2
4890	7	ROLLERS	5	3	7	2	2	8
			72	3	14	26	15	7

Pig N° 3 N°1 Birm	Hematite N°2 Birm	Steel Iron N°4 Birm	Scrap Iron N°5 Birm	Soft Core N°3 Birm	Hard Core N°6 Birm		£	s	d	£	s	d
15 —	147 —	196 —	83 —	24 —	308 —							
5 —						4/-	1	—				
	15 2					5/3	4	1	5			
		40 1				2/6	5	—	8			
			20 —			3/-	3	—	—			
				9 2		2/-	—	19	—			
					10 —	2/6	2	—	—			
					SUNDRIES		3	—	—	19	1	1
10 —	131 2	115 3	63 —	14 2	292 —							
				COMPANY	477	65/-	3	5	—			
				SMITH	30	1/4	2	—	—			
				CAVE	20 3/4	1/4	1	17	6			
				JOHNSON	24	d	—	12	—	7	14	6
										26	15	7
		RATE 1/6½ PER CWT.										

FIG. 1.—COST SHEET FOR HEAVY JOBBING FLOOR.

the event of a week in which the total weight of castings was either particularly heavy or light.

On the cost sheet (Fig. 1) was also collected the total weight of good castings made, and this weight was divided into the total cost of the materials and furnace labour, giving a price per cwt., which, in effect, was the cost per cwt. of the castings, as far as materials were concerned.

There were two ways of calculating the cost of the materials for any casting: either to use the cost per cwt. of the week in which the casting was actually cast, or to use an average figure, which could be determined by keeping a graph of the weekly price

* A Paper read before the Birmingham, Coventry and West Midlands Branch of the Institute of British Foundrymen, Mr. G. R. Shotton presiding.

Costs in a Jobbing Foundry

per cwt. The former method was preferred, since it meant that, when an awkward or large casting upset the foundry and made melting costs high, that particular casting suffered at least part of the extra cost. The remainder of the unproductive labour, such as supervision and the like, was taken in with the general overheads.

Costing for a Repetition Foundry

The second foundry was, originally, more after the style of category (2), for it was a foundry that specialised largely in municipal castings. This foundry had practically no costing system originally and, when a system was worked out, it was found that, owing to the number of different orders for small quantities, the moulders and coremakers *could* allocate their time to job numbers (or stock numbers, for stock items), but it was impossible for the fettlers to do this accurately. This was due partly to the quantity being handled in a day, and partly to the comparatively low mental standard of the workers involved. Even if it had been possible for them to cope with the mental arithmetic required, it is doubtful whether they would make a fair division of their time. This would be particularly true in small foundries, where a foundry

MAN	JOB No	DESCRIPTION	CWT	QRS	LBS	MOULDING & COREMAKING HOURS								£	s	d	LABOUR £	s	d	MATERIAL £	s	d	TOTAL COST £	s	d
42	4527	36 FLYWHEELS	40	1	4	9	4	9½	9½	9½	9½	51		4	15	7	11	5	8	18	12	7	34	13	10
31	4606	18 STANDS	9	0	0	9	4½	9	9½	9	9½	50½		5	-	-	2	3	6	3	10	6	10	14	-
46	4560	50 PISTONS	6	1	0	8½	4½	1	9½	9½	2	35		3	12	11	1	10	2	2	9	-	7	12	1
	4020	- GEAR BOX		-				7½				7½		-	15	7							-	15	7
	4716	1 PATTERN	9	0	4			1				1		-	2	1	-	-	2	-	-	3	-	2	6
	4705	9 ROLLERS	1	1	13						7½	7½		-	15	7	-	6	7	-	10	9	1	12	11
1	4704	1 ROLLER	0	1	11			1½				1½		-	1	1	-	1	8	-	2	9	-	5	0
	4725	30 SEGMENTS							1½	3	3	7½		-	5	2	-	2	6	-	4	3	-	11	11
98	4139	1 CASTING	0	0	10				2			2		-	4	8	-	-	8	-	1	2	-	6	6
	4739	1 DO	0	2	14					3½		2½		-	5	10	-	3	-	-	5	-	-	13	10
10	4654	CORES		-		8½		9½	9½	9	9½	46½		4	11	3							4	11	3
52	4654	8 COVERS	0	2	10	1½						1½		-	2	6	-	3	1	-	5	2	-	10	9
	4717	44 FRAMES	21	0	24	4	2	5	5	5	5	26		2	4	5	5	2	0	8	9	4	15	10	3
	4717	44 COVERS	10	2	0	3	2½	4	4	4	4	21½		1	17	7	3	19	9	0	9	3	12	0	7
08	4617	28 WELL FRES		—		4½	3		3½	2	3½	10½		-	14	5							-	14	5
	4617	56 SLIDES	0	0	20	2½	½		1	½		5½		-	4	7	-	-	10	-	1	5	-	6	10
	4654	100 COVERS	8	0	4	2½		6½	3¼		3	15¾		-	13	3	1	18	10	3	2	11	5	15	-
32	4654	111 BOXES	40	2	15	9	4½	8½	9½	9½	9½	50½		8	18	-	9	16	8	15	19	1	30	9	9
	4654	2 COVERS	0	0	18			¾				¾		-	-	5	-	-	9	-	1	3	-	2	5
29	4719	4 CHEEKS	4	1	24	3			5			8		-	14	8	1	1	0	1	15	-	3	11	2
	4614	3 PISTONS	3	0	0	1		6		0		13		1	3	10	-	14	0	1	3	0	3	1	10
	4584	- CYLINDER HEAD		—				2	6	4½	9½	22		2	-	4							2	-	4
			199	1	19									34	19	9	38	12	4	63	3	2	136	15	3

UNPRODUCTIVE LABOUR														
No	HOURS								RATE	£	s	d
55	9	9½	9¾	9	9	47¾			-/7½	1	8	1
1	3½		5	8½	2	2	14		-/8¼	-	9	7
08		2¾	3	7	2½	15			-/10½	-	13	1
2									-/11½			
4	7¾		9	10	8½	8	43¼		1/6½	2	19	5
13	9	4¾	9¾	11	9	9	51¾		1/5	3	13	3
33	9	4½	9¾	9¾	9½	9½	51½		1/6	3	17	3
30	8½	4½	9¾	9	11	9	51¼		1/10¾	3	17	4
67									1/8			
52	9		9¾	9½	9	9	46		1/8¾	4	-	3
50	9	4	9¾	11¾	9	9½	52¾		1/9½	4	15	-
42									1/10¾			
30			9¾		2	7½	15		"	1	8	1
28	9	4½	9	9½	9½	9	50½		"	1	14	9
29									"			
11					2		2		"	-	3	9
52									"			
98	8¾		9	10	9½	9½	44¾		"	4	4	4
10									1/11½			
31									1/11¾			
40				8¾		1½			2/1		2	8
19									2/1			
98									2/4¾			
								SUPERVISION		5	5	0
								TOTAL		36	12	4

PIG IRON		SCRAP IRON		H. COKE	S. COKE	COST		TOTALS		
GRADE D	FOUNDRY	No 9	No 8	No 0	No 1			£	s	d
59	0	15	0	487 1	199	0	108	0	79	0						
							40	0		4/3	8	10	-
								10	0	3/7½	3	0	0
20	0									1/1	11	1	8
				10	0					5/-	40	5	-
											63	3	2
										PATTERNS	14	10	9
										LABOUR	38	9	4
											150	15	3

FIG. 2.—COST SHEET FOR REPETITION FOUNDRY.

worker may mix sand, clean castings, load castings and do 101 other jobs each day.

Therefore, a cost sheet was created initially for each cast, which was then about every two or three days, and, finally, when the shop cast every day, one for each week was made and calculations were made as follow:—

First of all, the number and weight of good castings made by each moulder were collected on the cost sheet. Against these the time as charged by the moulder was entered and converted into £ s. d. On the other side of the sheet all the unproductive labour was assembled,

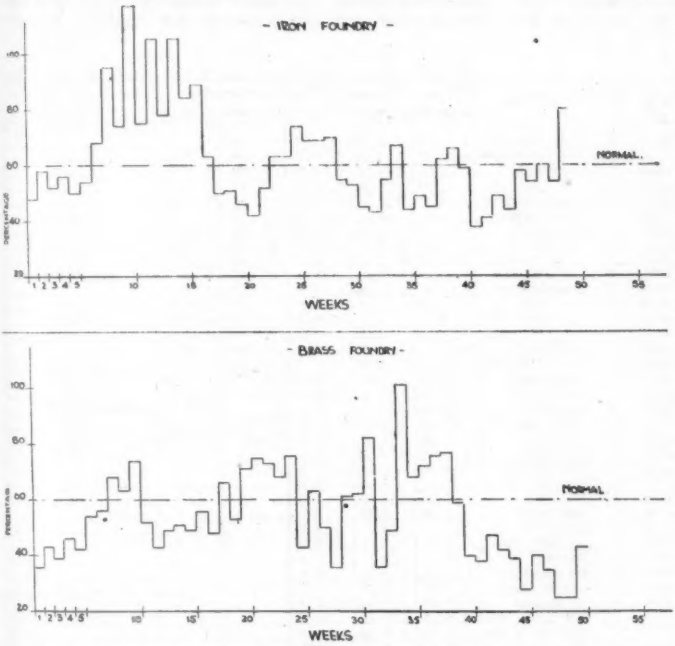


FIG. 3.—GRAPH SHOWING RELATIONSHIP BETWEEN PRODUCTIVE AND UNPRODUCTIVE LABOUR.

including the trimming, fettling and general core-making (which could not be attributed to any particular job), and this was converted and totalled, including a sum for supervision. The weights of scrap, pig-iron and coke used each week were also collected and converted into costs and finally totalled. The total weight of the castings made was then divided separately into the total labour costs and total material costs—so obtaining the rate per cwt. for the unproductive labour *and* for the material. The amounts were then calculated separately for each of the items listed by taking the weights of each item and these costs were entered under the appropriate columns. The final stage was to add together the moulding costs, the labour costs and the material cost, to give a total cost for the casting. These entries are shown in Fig. 2.

The only other feature not mentioned so far was the cost of the sundry materials such as sand, blacking, coal dust, chaplets, etc.

All these various materials were collected in an analysis column in the purchase day book, and these amounts were totalled each year. It was found that, on the average, this figure had a direct percentage relationship to the total amount paid for wages and basic materials, such as pig, scrap and coke.

Obviously, it is generally true that the more labour employed the more these sundries will be used and, similarly with heavier castings, requiring greater weights of pig and scrap, the larger will be the expenditure on these sundries. In practice this was found to work out at more or less a constant percentage.

In order, therefore, to allow for these sundries, there was added, for the purpose of costing, a percentage to the purchase price of both materials and labour. For instance, supposing that the sundries percentage was 15 per cent. and the cost of pig-iron delivered to the bins was £5 per ton, then the cost of the pig-iron would be calculated at £5, plus 15 per cent. = £5 15s. per ton. Similarly, action was taken with the wage rates, the whole thus covering this incidental expenditure.

Changed Conditions Vitiate Costing Systems

Both methods (1) and (2) worked well for their individual types of work, and they probably produced a reasonably accurate cost, but the moment the foundry operating on either of these systems began to take on work of a different nature (particularly with work of small quantities of great variety), the system broke down. In the first system it was found that the distribution of time had become inaccurate—particularly with regard to fettlers and trimmers. In addition, owing to the fact that the furnacemen's wages and other labour involved in casting and furnace work were being charged with the materials at so much per cwt., it was found that, when the weight of castings was reduced (when making light complicated castings), the furnacemen's wages, etc., being distributed on the basis of rate per cwt., were in effect being largely charged to the heavier castings whilst the light cast-

Costs in a Jobbing Foundry

ings really should have borne the extra cost. The perfect costing system would leave the cost of a simple and heavy casting at the normal low rate, and the extra cost would be allocated to the more complex job.

In the second system, the method broke down because the allocation of cost was almost entirely on the cwt. basis. Again, the result of this was that when light complex castings which involved considerable labour were made alongside the simple heavy castings, the latter took the brunt of the cost and the former came out cheaply.

Mixed Jobbing and Light Repetition Foundries

The two foundries are now amalgamated, and this has created what is probably the worst conditions for costing, for the repetitive work has almost entirely ceased and the concern now makes a very large variety of castings, ranging from pounds to 2 tons, and from inches to 12 ft. in diameter, and most of them in small quantities. So a system which has no pretence to originality was evolved. This at least does give consistent results and complete satisfaction.

The first point which was considered was the relationship between the *productive* time involved in making a job and the *unproductive* labour. The management was particularly anxious to reduce the amount of work involved in booking time on to jobs, especially where the division of that time was most unreliable; and, after examination, the conclusion was reached that there was a definite relationship between productive and unproductive labour. On investigation of various records kept, it was found that this could be regarded as a fixed percentage.

It is obviously true that a casting that has a quantity of cores, or involves much moulding, has more fin and flash to be removed by the fettler than a simple casting made in shorter time, and also requires more attendance for mixing sand, fetching cores, etc.

It was therefore arranged that the moulders and coremakers should charge their productive time to the job number, but where a coremaker was on coremaking of a general nature (such as strainer or runner cores) which were difficult to charge to a number, this time was regarded as part of the unproductive labour, which also included all trimmers, fettlers, labourers, moulder's time spent in labouring, and the like.

The total number of productive and unproductive hours worked were collected each week, and by keeping a graph it was soon possible to determine the average percentage which had to be added to the productive workers' time to cover the cost of the unproductive labour. In other words, mentally, a label was hung on each productive worker reading "I must

Job No	Quantity	Description	Weight each			Total weight			Material cost			Unproductive					
			Cwt	Qrs	Lbs	Cwt	Qrs	Lbs	£	s	d	Man	Hours	£	s	d	
4627	6	Worm castings	2	-	10	12	2	4	5	10	6	57	20	1	-	1	
4734	12	Sets M S meter boxes	-	1	22	7	2	10	3	10	6	58	48	2	3	2	
4680	5	Dump plate 7"	-	2	6	2	3	2	1	5	9	63	49	3	2	-	
4679	5	do do 9"	-	2	20	3	1	16	1	11	6	65	47	1	15	1	
4615	3	Hydrant boxes H I	-	3	-	2	1	-	1	-	11	75	13	2	1	9	
4760	1	Main B casting	1	1	-	1	1	-	-	11	8	70	12	2	-	-	
4097	2	Shields	-	-	9	-	-	18	-	1	6	77	60	6	2	2	
4143	90	Covers	-	-	12	9	2	16	4	9	6	81	55	5	14	11	
4295	5	Gulley frames G I	-	3	27	4	3	23	2	0	1	85	35	2	17	1	
4698	8	S G wheel 5 1/2	-	2	9	4	2	16	2	3	1	12	55	5	14	5	
4698	8	S G pinion 10 1/2	-	1	6	2	1	20	1	2	6	71	54	5	12	7	
4698	2	Box parts	-	-	14	-	1	-	-	2	4	15	52	5	9	11	
4766	1	S G blank 7 1/2	-	2	-	-	2	-	-	4	8	11	10	1	3	6	
4751	1	S G do 9 2/2	-	2	20	-	2	20	-	0	3	9	15	1	17	2	
4987	1	Crosshead	6	-	-	6	-	-	2	15	9	7	30	-	10	10	
4325	5	Sets M S meter boxes	-	1	22	7	2	10	1	-	9	21	41	-	14	11	
4692	30	M G blanks	-	-	18	4	3	8	2	4	9	28	14	1	-	10	
4652	21	Division plates	-	1	8	6	3	-	3	2	8	32	9	-	19	2	
4452	5	Brackets	-	2	24	3	2	8	1	15	1			48	19	7	Unproductive 56%
4394	10	Gulley bars G I	-	3	25	9	2	20	4	10	4	Productive wages		90	9	11½	
4528	4	Pistons	-	-	8	-	1	4	-	2	8	Total wages paid		140	9	0½	
4580	2	Main slides	3	-	20	6	1	24	3	-	1						
4679	1	S top part centre	-	-	20	-	-	20	-	1	8						
4753	12	W W blank 30 1/2	-	-	9	-	3	24	-	8	11						
4638	6	Pulleys	-	1	20	2	2	8	1	3	11						
4778	1	Base plate	-	2	8	-	2	8	-	5	3						
4778	1	Cider nut	-	1	-	-	1	-	-	2	4						
4658	1	S G blank 8 1/2	-	3	-	-	3	-	-	0	11						
4787	1	S G do 9 5/2	1	3	-	1	3	-	-	16	3						
4765	2	W W blanks 44 1/2	1	-	-	2	-	-	-	18	8						
4688	1	Haul off wheel	2	1	-	2	1	-	1	-	11						
4754	4	S G pinions	-	-	10	-	1	12	-	3	4						
4729	2	W W blanks 45 1/2	1	-	6	2	-	12	-	19	7						
4777	6	B G do 7 1/2	-	3	4	4	2	24	2	3	9						
4697	1	Trough	-	1	-	-	1	-	-	2	4						
4730	40	Transformer bracket	-	-	½	-	-	20	-	1	8						
4394	7	Gulley frames G I	-	3	27	6	3	21	3	4	4						
4613	1	S G ring 18 1/2	9	-	-	9	-	-	4	3	7						
4748	2	S G blank 9 2/2	-	2	20	1	1	12	-	12	7						
4554	42	Handles	-	-	2	-	3	-	-	0	11						
4701	6	Grids H H 40"	2	-	10	12	2	4	5	10	0						
4528	7	Cylinder B cover	-	-	2	-	-	14	-	1	2						
4679	1	Rumbler plate	-	-	16	-	-	16	-	1	4						
4685	1	B G blank pattern	-	2	-	-	2	-	-	4	8						
4128	1	W W blank 45 1/2	-	3	12	-	3	12	-	7	11						
4603	2	S G blanks 9 5/2	1	2	-	3	-	-	1	7	11						
4174	1	S G do 5 0/2	3	1	-	3	1	-	1	10	2						
		Parkins				54	1	20	25	0	4						
						204	2	20	95	1	9						

	Initial stock	Returned to stock	Used	Rate	£	s	d
Carbon	60	-					
Bentonite	166	2	143 2	23 -	8/-	9	4 -
Goldenbar	61	1					
M S Fig.	89	-	31 2	51 2	7/-	18	- 6
Scrap	230	-	118 -	152 -	4/-	32	8 -
Hard core	430	-	330 -	60 -	4/10	14	10 -
Soft core	211	-	191 -	20 -	4/2	4	3 4
Gas				125 T	-/8½	4	7 2
					Total	82	13 -
					15%	12	8 9
	9/3	per cwt			Grand total	95	1 9

FIG. 4.—COST SHEET FOR A MIXED JOBBING AND LIGHT REPETITION FOUNDRY.

earn X per cent. on my wages each hour I work to cover the cost of those who fetch and carry for me."

Productive to Unproductive Relationship

This percentage, shown in Fig. 3, might to some extent vary according to the class of work involved, but it was found in practice this was very slight. From week to week, quite bad fluctuations over or under the average figure can occur, but it is extraordinary how they do compensate each other, and, if traced back, it is frequently found that certain things happen one week to make that week expensive and the next week correspondingly cheaper. In personal calculations the rate per hour, which was used for the cost of the labour, was the net cost.

The firm collects, in addition, the weight of pig and scrap, also the coke used each week, and it totals the cost of these. To the total cost of these is added the furnacemen's wages. The weight of the good castings made is also totalled.

	ESTIMATE			DATE 2ND JAN 1945	
CUSTOMER	T.A. JONES & CO LTD. SQ. SWAN LANE, HIGHBRIDGE				
ENQUIRY	1-24" CAST IRON CLUTCHRING OFF CUSTOMER'S PATTERN				
	DRAWING N° X581				
				£ - s - d	
	MATERIAL	1-1-3 @ 9/6		12 - 2	
	MOULDER	2 HOURS @ 2/1	4 - 2		
	CORE MAKER	1 HOUR @ 1/10	1 - 10		
			6 - 0		
+60% UNPRODUCTIVE +15% SUNDRIES					
	=+84%		5 - 0	11 - 0	
	TOTAL COST			1 - 3 - 2	
50%	OVERHEAD ON LABOUR			5 - 6	
15%	DO ON MATERIAL			1 - 10	
	SELLING PRICE			1 - 10 - 0	

FIG. 5.—SHOWING METHOD OF ESTIMATING FOR QUOTING SELLING PRICES.

The next question is the distribution of the sundries and unproductive labour. In the same way as previously described, the total cost of the sundry materials is collected in the purchase day book, and, from a six-monthly or 12-monthly examination of the figures, the percentage which must be added to the cost of the total labour and basic materials to cover this item is found. On the cost sheet this percentage is added to the total cost—say 15 per cent.—and by dividing by the total weight of the good castings a cost per cwt. is established. With this the cost of each casting is calculated, and this cost is then transferred to the job number (Fig. 4).

To ascertain the total cost of the job, all that is necessary is to obtain the total productive labour cost, add the percentage for unproductive labour (say, 60 per cent.) plus, say, 15 per cent. for sundry materials, which may be simplified into one percentage, by compounding the two; that is, 84 per cent. is added to the original labour cost, and to this there is to be added the cost of materials. In estimating, of course, the same procedure is followed, using an estimated time and an estimated weight (Fig. 5).

The great advantage of this method is that costing and estimating are stabilised, since one uses a fixed average percentage to add to the productive labour. The melting cost per cwt. does not usually vary greatly except for some very good reason, which can be determined in advance—such as the need for using special mixtures.

The other good points of the system are that it does make the one-off special job expensive, which it rightly should be, and it largely alleviates sudden rises in cost due to one of those accidents which, of course, never occur in a well-organised foundry! It also enables the fixed figures to be kept under constant review so that any increase or decrease in costs can be seen and taken into account.

It is interesting to note that after the percentages had been established, and the management had had an opportunity of comparing costs under the old and new systems, it was found that the results for castings to which the original systems were applicable were practically the same; on the other hand, the ones which it was feared were coming out too cheaply and under the old system did, under the new system, cost more; and *vice versa* in the case of castings which it was considered should be cheaper.

The Author has purposely omitted any reference to pattern costs. These are also accounted for, but they are apart from the foundry costing system. The wood used and the patternmaker's time are charged direct to the job number and are regarded as costs figures to which the general overhead percentage of the whole firm has to be added. In the case of stock patterns—that is, the patterns that are not for any particular customer or job, but rather for general use, these are charged to stock numbers and totalled each year. But time spent in repairing stock patterns is regarded and charged as unproductive labour to the foundry.

It is not proposed to deal in detail with office overheads, because these are largely a matter for accountants and are often peculiar to the individual firm. In the Author's case, where there are a number of sections, those overheads, such as maintenance, plant depreciation, power, lighting, etc., which can be attributed to a definite section, are totalled and divided amongst the sections concerned in the appropriate proportion, and this gives a departmental overhead. Those items which cannot be divided are then regarded as a general overhead on the whole firm.

Overhead Costs Related to Time

There is, however, one point which should be emphasised. It will be noticed that with this costing system the bulk of the percentage, both for overheads and the costs in the foundry, have been related to time and not to per cwt. Reflection will dictate that a firm hopes to earn so much money per year, as an entity, for its shareholders, for rates, taxes, etc.; and these can be reduced to a figure to be earned each month, each week and, finally, each hour.

(*Continued overleaf, column* 2.)

LIGHTING UP OF NEW BLAST FURNACE

A time-honoured custom was observed at the works of the Renishaw Iron Company, Limited, of Renishaw, Derbyshire, when a new blast furnace was lighted there on April 23. The torch was placed to the tuyere hole by 15-year-old Anne Hooton, daughter of a director of the company, and the Rev. C. W. Silk, Rector of Eckington, blessed and dedicated the furnace, his prayers including one that the workmen at the furnace be preserved from all danger. Later, free beer was distributed to the 350 men employed at the works. Similar ceremonial occurred when the first furnace was lighted at Renishaw, 153 years ago, and has marked every subsequent lighting there.

Renishaw Ironworks were founded by Thomas Appleby, in 1792. Their first blast furnaces were rectangular stone structures, approximately 15 ft. high, which together produced some 10 tons of pig-iron a week. Thirty tons was about the maximum stock load of the business in those early years, so when stock to that quantity was reached, it was found necessary to damp down the furnaces to avoid congestion. Even after 14 years of activity, Renishaw's total output had reached only 975 tons annually. However, the quality of the iron seems to have been very satisfactory, because a "tombstone" made of iron smelted at the works, recording Appleby's death in 1814, was unimpaired by over 100 years' exposure in the local churchyard. This relic is now preserved at the company's offices, its lettering being practically as perfect as when the "stone" was made.

Modernisation Scheme

The building of the new No. 2 furnace was begun just over two years ago. The old No. 2 had become in need of very extensive repair, so it was decided that the furnace should be rebuilt as part of a scheme for modernising the works and increasing their output. Since July, 1942, when the old No. 2 was put out, Renishaw has produced its quota of iron by the intensive use of only one furnace—the No. 1, which has, incidentally, smelted over 250,000 tons of iron since 1940. The new No. 2 is over 85 ft. high and will have a weekly capacity well in excess of 1,000 tons.

Capt. J. F. Stanier, now managing director of the company, has played a leading part in planning the reorganisation of the works. About five years ago he was recalled from active service to become general manager at Renishaw; and among the tasks he has supervised have been the building of the new furnace, the conversion of former stables into an up-to-date canteen for the workpeople, and the construction of showerbaths and other improved washing facilities for the men. These baths are open right through the week and are available to the men at all times—off-duty periods included.

The increased productive capacity of the works will exercise a beneficial influence upon the whole neighbourhood of Renishaw, by providing additional employment, both directly and indirectly. It greatly increases the company's post-war opportunities.

SOIL CORROSION: RESISTANCE OF FERROUS AND NON-FERROUS MATERIALS

Mr. K. H. Logan and Mr. M. Romanoff, in a Paper entitled "Soil-corrosion Studies, 1941: Ferrous and Non-ferrous Corrosion-resistant Materials and Non-bituminous Coatings," printed in the "Journal of Research of the National Bureau of Standards," Vol. 33, pp. 145-98, describe the condition of a large variety of materials, and of a number of metallic and organic coatings exposed, for periods of two to nine years, in 14 different corrosive soils. For various reasons, which are stated in the report, the results of the investigation cannot be regarded as giving exhaustive information, but they provide useful data which can be applied in the selection of materials for use in certain specific locations and types of exposure. The characteristics of the soils at the respective test stations are described and tabular summaries are made of the composition of the materials exposed, and of their condition after test.

The results show that, although the addition of small percentages of alloy elements somewhat improves the resistance of ferrous materials to some soil conditions, the improvement so effected cannot be considered significant. "Ferrous materials must contain very considerable quantities of nickel, chromium and other elements if they are to withstand the action of severely corrosive soils. Steels high in nickel and chromium are very resistant to nearly all soil conditions, and in all the soils the high-alloy cast iron (Ni-Resist) proved definitely superior with respect to both loss of weight and pitting to the other cast irons exposed."

Under most of the corrosive soil conditions included in the tests, copper and alloys high in copper are very resistant to corrosion. Corrodibility appears to increase with the amount of zinc present in the alloy, and dezincification plays an important role in the corrosion of brass. Addition of 0.08 per cent. arsenic to Muntz metal did not prevent dezincification.

COSTS IN A JOBBING FOUNDRY

(*Continued from previous page.*)

Now, on the other hand, if a concern has budgeted on a certain weight of castings—say 150 tons—to give a figure per cwt. for overheads, it is quite possible, with the same number of hands, working the same number of hours and with practically the same overheads, the tonnage might be reduced to 110 tons, due to the castings being of a more complex nature. This will mean the firm has only earned its overheads at per cwt. on a small number of castings, which will be insufficient; whereas, had it been related to a time basis, it would have earned the same money in a busy year.

In conclusion, it should be mentioned that the figures quoted are not dead accurate, as an effort has been made to simplify the arithmetic. It is not asserted that this system is perfect, but it can be said that it does actually work.

BEARING DEVELOPMENTS

By P. T. HOLLIGAN, B.Sc.Tech.

Discussion on Paper read before the London Branch of the Institute of British Foundrymen

Below we publish a report of the discussion on a Paper read by Mr. P. T. Holligan, B.Sc.Tech., technical adviser, Commercial Division, Glacier Metal Company, Limited, before the London Branch of the Institute of British Foundrymen, Mr. J. F. Kayser presiding. The Paper was printed in our last issue.

The BRANCH-PRESIDENT (Mr. J. F. Kayser), who had quite recently returned from a visit to the United States of America, recalled a reference by Mr. Holligan to the vital importance of the bearings in marine engines, for the ships must get home. It had impressed him very forcibly, because only 19 days previously he was wallowing about in a ship in a submarine-infested sea, the ship having broken down due to a bearing failure! He complimented Mr. Holligan on an ideal lecture.

MR. R. B. TEMPLETON (past-Branch-President) was particularly interested in the reference to cast crankshafts. Nowadays, he said, founders were often asked which was the most suitable material to use as a bearing for cast-iron crankshafts; it would appear, from Mr. Holligan's lecture, that the copper-lead alloy is being adopted to a great extent. It would be interesting to have figures regarding wear on copper-lead bearings, as compared with the white-metal bearings. He also asked whether there would be any difference in the composition of the bearing material for a 4½-in. shaft, for example, compared with a 1½-in. shaft.

Bearings for Cast-Iron Crankshafts

MR. HOLLIGAN replied that perhaps he had not made the position clear with regard to copper lead bearings and cast-iron shafts. Copper lead was not necessarily the most suitable bearing material for a cast-iron shaft; sometimes the converse was true. If the loading conditions in the machine were such as to demand a copper-lead bearing, well and good. But he would not say that because a cast-iron shaft was used, it was necessarily advisable to use a copper-lead bearing material. If the stress conditions were such that white metal would do the job, his company would invariably advise the use of white metal; they did not advise the use of copper lead if white metal would take the loads and speeds involved.

Further, quite recently they had determined that white metal itself ran better against graphitic cast iron than against mild steel. The difference was not profound, but it was there. It must not be assumed from that, however, that white metal did not run satisfactorily against steel, because in fact it did.

Dealing with the question as to whether or not one should change the bearing material by virtue of a change from 1½-in. to a 4½-in. shaft, he said that again the question was tied up with bearing loads. If the conditions demanded the use of a copper-lead bearing, one would have arrived at that conclusion from considerations of bearing loadings, velocity, and so forth, and one would recommend copper lead because white metal would not stand up to the conditions. One would still recommend copper lead where such conditions obtained, whether a 1½-in. or a 4½-in. shaft was used.

MR. KING, dealing with the reference to the 85-5-5-5 and other gunmetal bearings and the necessity for more robust design as the lead content increased, said that that would bring economics into the problem. He asked if the buyers of that type of bearing were prepared to pay more for it because it was necessary to have a larger feeding head, for that meant a smaller number of bearings per ton of metal cast.

MR. HOLLIGAN said that he had referred to the 85-5-5-5 material as a replacement or alternative for the 88-10-2 alloy. He did not think it was more expensive than the 88-10-2; indeed, he would have thought the contrary was true, in view of the lower tin content of the 85-5-5-5 material. Again, he would have thought that the situation in respect of larger feeding heads did not arise at the 85-5-5-5 stage; he believed that one did not need to provide extra feeders, and so forth, with that material, as compared with the 88-10-2 alloy, but he agreed that it would be necessary in alloys of higher lead content. The problem then would be settled, not on the grounds of first cost of the bearing material, but on the demands that would be placed on the bearings in service. Those were the demands which settled whether or not one had to use an inexpensive bronze or an expensive lead bronze. If the first cost were the deciding factor, there would be no copper-lead bearings in use to-day, because they were very much more expensive than white-metal-lined bearings.

Aluminium-base Metal Bearings

MR. A. J. MURPHY, M.Sc. (Branch Vice-President) commented that no one could speak with more authority than Mr. Holligan on the subject of bearings, for he was engaged in the manufacture of the highest grade of bearings. He recalled also that, earlier in the war, Mr. Holligan and himself and others interested in tin-base bearing metals had had the melancholy task of explaining to Government representatives that they could manage very well without tin-base bearing metals. It was hoped that their arguments would not come home to roost too often after the war, when tin was again in better supply!

Asking for Mr. Holligan's views as to the use of aluminium-base bearing metals, MR. MURPHY said he had the impression that they had not established themselves in a very wide field of application. However, he asked what were their prospects, and whether there were any fundamental shortcomings which would prevent their wider use.

With regard to the explanation of the conditions in which it would be wise to change to the use of lead-bronze bearings, he said he had always understood that the essential feature of the lead-bronze-lined steel-

Bearing Developments

backed bearing, the feature which gave it its great value, was its high resistance to fatigue. He understood that the repeated failure of a white-metal bearing through the cracking and crazing of the surface was a sign that the conditions called for the use of a lead-bronze bearing. Presumably that was based on Stanton's work, of 15 or 20 years ago, on the fatigue of bearings; Stanton had shown in a rather pretty manner the crazed appearance of linings in high-speed Diesel engine connecting rod big end bearings, due to repeated bending.

It had been a little surprising to hear Mr. Holligan say that the 80-10-10 material was not suitable where interference fit was required for its mounting, and one gathered that that was because of the low elastic limit or yield point of the material. That was rather odd when one recalled how the metal bushes were fitted; in his experience their elastic properties were very poor indeed, and yet the users seemed to "get away" with interference fits for their mountings.

The Tin to Copper Ratio

Coming to the bearing properties of the leaded tin bronzes, he said the bearing properties of the copper tin were well known to depend upon the presence or absence of the hard constituent, and that was a function of the ratio of tin to copper. It was sometimes forgotten that, when one began to load up an alloy with lead, one altered quite appreciably the ratio of tin to copper. For example, 10 per cent. of tin in a copper alloy in the presence of 20 per cent. of lead gave a much higher ratio of tin to copper than when the 10 per cent. of tin was present and there was no lead. Thus, the tin content must be reduced when lead was added, in order to give the same proportion.

Referring again to the lead bronzes, Mr. Murphy said that the 80-10-10 composition was used in heavy bearings, and had been used for years with great success in applications such as railway wagon bearings, and so on. Even the alloy containing 8 per cent. tin and 15 per cent. lead was used very successfully for those heavy bearings; and they were robust, as they must be in order to withstand the knocking about and indifferent lubrication which railway stock sometimes had to suffer.

Emergency Properties

MR. HOLLIGAN replied that one must be guarded when discussing the aluminium-base bearing materials. They provided the same sort of problem as did the copper-lead alloys from one point of view, in that the orthodox aluminium-base bearing materials which had been developed so far were all relatively hard materials. He had in mind RR. 56 and other alloys of that description, many of which were heat-treatable and were relatively hard, having Brinell numbers of the order of 70. Secondly—and his remarks were made very tentatively—it appeared to him that the aluminium-base bearing materials had what the Germans would call rather poorer "emergency properties" than had the copper lead alloys. It had been his experience, and he believed the experience of others, that if the lubricant became scanty at any moment, or if the clearance space were inadequate, the aluminium-base materials had a tendency to seize with extreme suddenness and without warning; and when they did that, they made a real job of it! On the other hand, the copper-lead materials, generally speaking, gave warning by rise of temperature some little time before seizure. He had conducted some work on the bonding of aluminium-base bearing metals to steel. There was the everlasting aluminium oxide film to dispose of, which was very difficult; but there was also the paradoxical fact that in certain bearing tests in which seizure had occurred, he had found there was a bonding to the steel shaft, so severe that he could not even chisel it off. Speaking personally, he felt there was much to be done yet in developing the aluminium-base bearing materials.

The conditions which demanded lead-bronze or copper-lead bearings were those which resulted in the fatigue failure of white-metal bearings. He would not recommend material other than white metal if white metal would do the job.

With regard to interference fit with 80-10-10 bushings, he said there were literally tens of thousands of such bushings in operation. The point he had made was that, when considering interference fit, one could not use so thin a bush in that material as one could in phosphor bronze. He exhibited a thin bush in 80-10-10, which was doing its job; but he had had in mind even thinner bushes, for which one would have to think twice before using 80-10-10 because of the interference fit problem. It was all a matter of degree.

Again, if operating conditions were such that there was an appreciable rise of temperature—for instance, from room temperature to 120 deg. C.—and if one were using a very thin lead-bronze bush, that bush might work loose by reason of differential expansion. It could not expand because of its steel housing, and therefore it tended to close in, and, when it cooled down, it might become loose.

Expressing agreement with Mr. Murphy that the alteration of the copper/tin ratio when lead was added was often overlooked, Mr. Holligan recalled Fig. 8, showing the structure of an alloy containing 20 per cent. lead and 5 per cent. tin (etched), and said there was a considerable amount of δ constituent present because the copper/tin ratio had changed by reason of the addition of lead.

Overseas Practice

MR. P. D. LIDDIARD invited comments on differences as between the practice in this country and America. First, in regard to phosphor bronze, he said we had the 2B8 specification with a minimum of 0.5 per cent. phosphorus, and the Admiralty specification with a minimum of 0.3 per cent. phosphorus. In the United States, however, phosphor bronze quite often contained only 0.1 per cent. of phosphorus, and sometimes the maximum was 0.25 per cent.; one rarely met with a phosphor bronze with a phosphorus content greater

than 0.25 per cent. in the United States. Usually the description "phosphor bronze" meant there a bronze which merely contained sufficient phosphorus for deoxidation.

Secondly, with regard to the use of copper lead, in the United States the preference appeared to be for silver-lined bearings, whereas in this country engineers did not appear to get on very well with silver-lined bearings; very often, in the case of engines imported into this country from the United States, copper-lead bearings were substituted for silver bearings.

Silver Bearings

MR. HOLLIGAN said there was an unsolved mystery in that connection. Many of the American aircraft engines had silver bearings, but some engines coming to this country for re-fit were fitted with copper-lead bearings. One could only add that well-known American aircraft engines were doing their job very satisfactorily on silver bearings.

MR. MURPHY commented that silver was rather a drug on the market in America, and a lot of money was being spent on research to find uses for it. Indeed, he believed that one of the magnesium plants had many thousands of pounds worth of silver tied up. So that the silver bearing was economical in America on the same footing as the copper-base bearing in this country.

Use of Indium

MR. E. R. WELLBURN asked whether the availability of indium in America had led to the use of silver of improved properties, the improvements being brought about by making comparatively small additions of indium, just as we were using indium to some extent in this country to run-in bearings at an early stage. In many applications, he continued, a bearing metal was required to be a moving component in the structure, and it became extremely difficult to balance the bearing properties against the required tensile strength in many designs. Even phosphor bronze had insufficient tensile strength to meet the requirements. He asked for Mr. Holligan's view of the possibilities of developing a higher tensile strength bearing material having good bearing properties, for use in cases where a bearing was necessarily a moving component in the design.

MR. HOLLIGAN did not pretend to be able to speak with authority about silver and indium, but he did not think that indium direct on copper lead had been used to any great extent. His information was that the only reason for the use of indium on the lead was to impart corrosion resistance. It was a function of the particular type of oil used and the operating temperature; when a certain temperature was exceeded, the lead might dissolve. He did not think the lead indium itself was a better bearing material than lead.

Again, in the case of silver, his information was that the silver was lead plated and then indium plated, in order to combat the corrosion of the lead. He believed that in certain aircraft engines, if the silver bearings were merely lead plated, the lead would dissolve away and expose the silver, which then had the tendency to seize. So that it was necessary to impose another layer of indium on the top.

He could not answer in a general way the question concerning a material for a bearing which was a moving component in a design. It seemed to him that if one demanded high tensile strength in a bearing material such that even phosphor bronze would not have sufficient tensile strength, one would have to use a steel-backed component. But the design would be the determining factor, and the design might be such that that solution was quite impossible. However, one would think automatically of a steel-backed bush, copper lead or white metal lined, and shrunk on. Otherwise, if one were searching for a higher tensile material, it seemed that one would have to sacrifice bearing properties or make the mating surface of a hard material.

MR. WELLBURN said that in the case he had in mind it would be impossible to use the type of bearing suggested. He was thinking particularly of a component carrying two sets of splines, one internal and one external, bearing on steel components, which would be hard. Without doubt one would have to sacrifice bearing quality.

MR. HOLLIGAN suggested that one might have to use a phosphor bronze, or a wrought bronze of lower tin and phosphorus content, or a chromium bronze.

Bearings for Railway Wagons

MR. G. W. MANN, *apropos* the reference to bearings on railway wagons, said he understood the British practice was to use a tin-base alloy, containing a minimum of 80 per cent. tin with possibly 10 per cent. of antimony and 5 per cent. of copper. The German Bahnmetal was a lead-base alloy containing also approximately 0.7 per cent. calcium, 0.6 per cent. sodium and 0.04 per cent. lithium. American practice was similar to the German, except that their alloy ("Satco") contained 7 per cent. tin and some magnesium, some mercury, some calcium, some lithium, some aluminium and some potassium. He would like some idea of the theoretical considerations on which future research on bearing metals would be based.

"Bahnmetal"

MR. HOLLIGAN found it difficult to believe that alloys such as Mr. Mann had mentioned were developed on scientific grounds; he could not be sure, of course, but he could not help thinking that alloys containing a pinch of this, that and the other were arrived at empirically. He had yet to be convinced of the virtues of many of those extraordinarily complex alloys; having analysed some of them, he had found most incredible compositions, and he had yet to find any really scientific proof that the various additions had any real virtue. When pinches of magnesium, mercury, and so on, were added, it seemed that someone had looked at the periodic table to see what else could be put in. Perhaps the origin of the German Bahnmetal was to be found in the problem of raw material supplies. However, he believed that material had been used successfully for railway work in Ger-

Bearing Developments

many in the period between the two wars. But he understood that there were servicing snags; it had been necessary to establish special re-metalling stations, under scientific control. He added that his company had tested some of the complex lead-base alloys and had still to be convinced that they had any particular virtue.

When considering future research, he felt that our fundamental knowledge on bearings was still very slight. Probably the most recent fundamental work on friction was that by Bowden and his fellow-workers, and that particular work, which was not so very old, demonstrated how incomplete was available fundamental knowledge. Industry must strive for a better understanding of the bearing problem, to find out what really happened at the bearing interfaces, and so on. In the meantime, however, bearings had still to be supplied, and one could only approach the problem of compositions in a logical sort of way. One would not start by adding half a dozen things at once to a lead-base alloy. One would work in a systematic manner, making one addition at a time, and develop a series of more or less scientific experiments.

MR. MURPHY said that a year ago, when there was a grave shortage of tin, the Germans had not used Bahnmetal on the main bearings of locomotives, but had still used tin-base bearing metals. That was sufficient commentary on what the Germans thought of tin-base bearing metals as compared with Bahnmetal.

Usually Accepted Theory Queried

MR. F. HUDSON, discussing fundamentals, said that if one looked through a text-book or the literature generally on bearings, one would encounter attempts to define the ideal structure for a bearing metal, and invariably one would find something written about hard particles embedded in a soft matrix. He, personally, had felt for many years that this theory was altogether wrong, although there were engineers and even well-known metallurgists throughout the country who still held to it. When one saw pure silver doing the job, and also indium and copper-lead types of alloys, one could find no reconciliation between the structure of these metals and the accepted theory of what a good bearing metal should be. He asked whether Mr. Holligan agreed with him on this point.

Recalling Mr. Holligan's reference to the importance of porosity and the effects of small pinholes, Mr. Hudson questioned whether a very small hole, say just a pin-prick on the surface of a white-metal lined bearing, really mattered. Bearing in mind that engineers drilled oil grooves and even oil holes in the bearings, he could not see that a very small pin-prick on the surface would have any serious effect on the functioning of the bearing. However, Mr. Holligan's opinion on the matter might help the practical foundryman quite appreciably.

Thick and Thin Linings

MR. HOLLIGAN confessed that he still could not make up his mind with regard to the age-old theory of bearing metals; he felt, with Mr. Hudson, that that theory had been partially disproved by the fact that silver had proved to be a good bearing metal. He qualified that, however, by recalling statements he had heard, and which he believed had been published in technical Papers, that *pure* silver had not proved a good bearing material; in other words, it was claimed to be necessary to provide a very thin lead layer, because pure silver appeared to have a tendency to sudden seizure. He believed that Dayton and his colleagues had mentioned in their Papers some years ago that it performed perfectly well under conditions of maximum loading, but under conditions of inertia load it developed a tendency to sudden seizure. If that were so, perhaps the time-worn theory could not be entirely discredited.

He, personally, related the question of composition and structure to thickness of lining, and had in mind then only the load-carrying capacity. If one were thinking in terms of thick linings, where the white metal was so thick that it could squeeze out laterally by reason of high loadings, some mechanical strength was needed in the white metal to resist the compression load, and it was necessary to add antimony and copper and so forth. In the case of thin linings, where that type of stressing was absent and the squeezing out laterally did not occur, provided adhesion was good, the time-worn theory fell to the ground. It was a matter of the ability of the metal to withstand compression loading.

Expressing agreement with Mr. Hudson's remarks on porosity, he said he wished that somebody would convince users on that matter. Provided the porosity was not of the inter-crystalline, inter-dendritic type, but was in the form of perfectly clean gas holes, he did not think there would be difficulty. A bearing might be scrapped by any bearing manufacturer because it had a tiny pin-hole; but, frankly, from the functional point of view, it did not matter in the slightest degree. The necessity was to learn more about the behaviour of bearings, and then to convince the users on sound technical grounds that such a pin-hole did not matter.

Pin-hole Dangers

MR. MANN said he would have thought that any porosity in a lining would serve to concentrate stresses, and, therefore, the lining would fail ultimately by fatigue. But in the bearing itself one doubted that it would have a major effect.

MR. HOLLIGAN agreed that that was a good point, but it was one on which he had not sufficient knowledge. He had stressed particularly, in reply to Mr. Hudson, that the inter-dendritic type of porosity would be most undesirable; it would form a starting point for fatigue cracks. When discussing fatigue failure, he had in mind always the lining material. Clean gas-holes or blowholes were usually spherical and were

not likely to start fatigue cracks, because white metal was relatively elastic. However, it could happen. In a very highly stressed bearing, such as a Diesel big-end bearing, such porosity would be undesirable; but in less highly loaded bearings it probably would not matter.

Quality Specifications

MR. FRENCH (visitor), recalling an earlier question about keeping the phosphorus content low in phosphor bronze, in preference to increasing the tin content, asked for Mr. Holligan's opinion as to the preference for using the copper of the copper phosphide rather than the normal tin hardener. Secondly, when he was first introduced to bearings, he was told that the bearing metal should be kept zinc-free. Indeed, one received orders for zinc-free bearings. He asked for Mr. Holligan's comments on that. Finally, he asked for information on the use of nickel for keeping the lead well distributed in the higher-lead bronzes.

MR. HOLLIGAN, replying to the question concerning the copper phosphide constituent, said there was a remarkable difference in practice as between this country and America. What the Americans called phosphor bronze was probably an appreciably softer material than the 2B8 phosphor bronze, and was therefore less likely to cause wear of the component or to suffer wear. Though he had not much experience of American practice, he imagined that was a reason for avoiding the copper phosphide constituent, if it enabled softer shaft material to be used or if it reduced wear of the bearing material.

A very small percentage of zinc would completely upset the structure of a tin-base white metal. One could not say definitely that that did not matter; but it had been found to modify structure in an apparently undesirable way.

Nickel had been found to be of advantage in certain of the lead bronzes; on the other hand, he had not found it to be of advantage in copper lead. In his opinion that difference was tied up with the relative methods of manufacture, casting and cooling. He could only speak from his own company's experience.

Influence of Raw Material Cost

MR. S. EVANS said industry had started with the old white bearing metal, which was a high-tin alloy, and had gradually substituted higher percentages of lead. He wondered whether that change of composition, and the change from 10 per cent. of tin in Admiralty gunmetal to various alloys with higher percentages of zinc, were bound up with the price of tin. If by some dispensation of Providence the price of tin were reduced to a figure which the normal metallurgist would consider to be reasonable, one wondered whether research would continue along the lines it had followed, whether the satisfactory performance of a bearing metal was bound up with a high content of hard particles in a soft matrix, or whether the flowability of the metal at sub-normal temperatures—sub-normal as compared with hot bearings—had something to do with it.

He would have liked to have heard more of the relative importance of the maintenance of the old film and the physical properties of the bearing metal under the film. He asked whether a bearing failure was generally due to the momentary failure of the oil film and the consequent metal-to-metal contact between shaft and bearing metal. It was a question as to whether we were exaggerating the importance of the composition of the bearing metal in relation to the importance of the conditions under which that composition was used.

If tin were as cheap as lead, would very many more tin-base bearings be used; and would copper lead, even up to 30 per cent. of lead, and the complex copper-bronze alloys, including phosphor bronze, have achieved the importance they had in fact attained?

MR. HOLLIGAN felt that if there had not been a shortage of tin, much of the research which had been conducted on the lower-tin materials would not have been done, which would have been a great pity, because the mere shortage of tin had forced industry to investigate the possibilities of the lower-tin materials. In many cases there had been some very pleasant surprises; the substitution of the lower-tin alloys in many cases, though not all, had shown results equal to those achieved with the high-tin alloys. In highly stressed Diesel or petrol engine bearings, lead-base materials had not performed as satisfactorily as the tin-base, speaking generally. But research had been stimulated, and that was all to the good.

Dealing with the question concerning the maintenance of the oil film, he said there was always the question of fatigue failure occurring for purely mechanical reasons, such as the flexing of a connecting rod, etc., whether or not the oil film was maintained. But with that proviso, if one could be assured that the oil film would always stay put, all sorts of bearing materials could be used which at present were not used. Various compositions of bearing materials had been evolved, having rather particular virtues, because one could not always ensure that full fluid lubrication would be maintained. Brass-to-brass would do if there was always an oil film present. Flexure occurred, leading to a momentary squeezing out of the oil, and it was necessary to provide materials which would carry over that momentary metal-to-metal contact.

Vote of Thanks

MR. MURPHY, proposing the thanks of the Branch to Mr. Holligan, said that one admired, not only the lecture, but also the candid way in which he had dealt with the questions in the discussion; that would impress upon those who had not met him before that he was master of his subject.

(The vote of thanks was seconded by Mr. Mann, and was heartily accorded.)

MR. HOLLIGAN, in a brief response, said he had derived great pleasure from the meeting, and he had appreciated particularly the discussion.

THE AMERICAN WAR PRODUCTION BOARD reports a serious shortage in cast-iron soil pipes.

INCREASED ACTIVITY OF THE LONDON BRANCH

Further Rise in Membership

The annual general meeting of the London Branch of the Institute of British Foundrymen was held at the Charing Cross Hotel, London, W.C.2, on April 25, Mr. J. F. Kayser (retiring branch-president) in the chair.

Finance

MR. V. C. FAULKNER (branch hon. secretary and treasurer), presenting the accounts for the year, said the balance sheet reflected the increased activity of the branch. It had remitted about £75 more to head office, but, owing to the creation of the new section at Slough and an increasing membership, nearly every item showed added expenditure. The actual cost of operating the branch had increased from £84 to £109, and had averaged 4s. 1d. per member. The average amount per member remitted to head office was £1 9s. 5d., leaving a mere 25s. for the whole of their extensive services.

The accounts and balance sheet were formally adopted, without discussion.

Annual Report

Presenting the annual report of the branch council—the fifth he had been privileged to present during his second period of office as hon. secretary—MR. FAULKNER said it marked the end of a distinct period in the history of the Institute. It had been characterised by a marked increase in the lecture programme, a serious curtailment of works visits, a virtual cessation of social events and increased attention to non-ferrous practice. Despite everything, however, real success had been achieved.

Technical.—Since the last annual meeting, important meetings had been held. The first was a joint meeting with the Institute of Works and Costs Accountants, when Mr. G. Stone, the president-elect of that body, had given an interesting interim report on the progress made in the field of unified costing systems. In September there was a full-length presidential address by Mr. Kayser to the branch on "Specifications, Inspection and Control." That was followed by a talk from Mr. C. Monseur on Europe under the heel of the invader. Later Mr. F. H. Hoult had given his excellent Paper on the development of a technique for the production of a special light alloy casting. Prior to the presentation of that Paper, there was an informal address by Mr. J. W. Gardom (president of the Institute). The next lecture was of a similar character to that of Mr. Hoult's, but dealt with the production of a steel casting; it was given by Mr. Malcolm Brown, works manager of Hadfields, Limited. For the next meeting Dr. Skerl had very kindly stepped into the breach at short notice to deal with refractories.

The president had returned from an extensive tour of America to preside over the January meeting, which was deemed to be an outstanding success. A lecture on bearing metals was presented on that occasion by one of the branch members, Mr. P. T. Holligan. The final lecture of the session was given by Mr. A. E. McRae Smith, who was always very popular with London audiences. He had reviewed in some detail the inoculation of cast iron. The session had closed with a Short Paper Competition and the reading by Mr. Mann of an abstract of the Metropolitan Exchange Paper. The short Papers submitted were of higher quality than formerly and the prizes were well merited.

Membership.—With sincere satisfaction, Mr. Faulkner reported that the membership of the branch had reached the record total of 525. At that level the branch ranked as the second largest grouping of foundrymen in the world, Chicago being the largest. During the year the increase was 56. At present there were three honorary members, the same as in the previous year, 18 (17) subscribing firms, 277 (270) members, 219 (176) associate members, and 8 (3) associates. Thus, of the total gain of 56, the associate membership grade accounted for 43. That was very important, he said, because it had a profound influence on the financial resources of the Institute. There were 14 members serving with the Forces, and a further 24 were resident overseas. In that connection Mr. Faulkner said it was pleasing to hear that Capt. Peter Lake had been rescued by the United States Forces from a prisoner-of-war camp and had returned to his home at Braintree.

Increased Interest in Technical Matters

For the future policy of the branch it was advisable to realise that since the outbreak of war no fewer than 249 members, representing an increase of over 50 per cent., had entered the branch, and of those it was estimated that about 40 per cent. had predominantly non-ferrous interests. During the 1944-45 session probably no fewer than 1,000 people had listened to lectures organised by the branch and its sections, whereas in pre-war days the number was probably of the order of 300 to 400. That reflected the enormous increase of interest in technical matters in the industry.

East Anglian Section.—The section had had a particularly successful session under the experienced presidency of Mr. C. H. Kain (past-president of the London branch). A full technical session, including works visits, had been carried through. Great attention had been given to education, and one local student, Mr. J. Goymour had brought the Buchanan Prize to the London area for the first time. Much of the success of the section was due to Mr. A. N. Sumner, who was not only the hon. secretary, but also a leading personality in the educational work; he actually conducted classes himself.

Slough Section.—There seemed no reason why the new section should not maintain, under peacetime conditions, the wonderful progress it had made. The lectures were exceptionally well attended and the local committee was showing both enterprise and enthusiasm. Mr. Faulkner expressed his personal gratitude to Mr. J. Pike, the hon. secretary, for his cordial co-operation, and congratulated him upon his initial success.

Distinctions.—The council of the branch had utilised the occasion of their December meeting to honour Dr. Griffiths (president of the Institute of Metals and a member of the branch) and Mr. J. W. Gardom (president of the Institute and a past-president of the branch) by offering them a complimentary luncheon.

Congratulations were due to Mr. D. Cherry Paterson, who had been elected president of the Foundry Trades' Equipment and Supplies Association. Another member of the branch, Mr. V. Elkington, had been elected Master of the Coopers' Company. Mr. I. Ross had well merited the award of the Institute's Diploma for his Paper on "A Large Magnesium Casting."

Ironfoundry Fuel Conservation

Inasmuch as the London panel had completed its task, Mr. Faulkner, on behalf of the branch, paid tribute to its chairman, Mr. R. B. Templeton (branch past-president), whose enthusiasm and drive alone had made that result possible. The thanks of the branch were also accorded the hon. secretary of the panel, Mr. H. Forrest. (Mr. Faulkner read Mr. Templeton's report on the fuel situation.)

Education.—The council had devoted much time during the year to the institution of better facilities for technical education in the London area. A committee had been appointed and several meetings with interested authorities had been held. Mr. Faulkner expressed the hope that, inasmuch as he was being relieved of the onus of the secretaryship of the branch, he would be permitted to carry on the work that had been instituted. Dr. Douglas Ingall was doing much work, and already the branch was much indebted to him for his willing co-operation.

Members' Co-operation

The very considerable progress indicated by the report, said Mr. Faulkner, had been made possible only by the wholehearted co-operation of the members. Especially was he grateful for the sympathetic help accorded him by the branch-president (Mr. Kayser), which help was limited only by his enforced absence in America. That absence had thrown extra work on the two vice-presidents, Mr. A. J. Murphy and Mr. G. R. Webster, who had both been a tower of strength to the branch. Especially were the thanks of the branch due to Mr. J. P. Ellis for his efficient work as lanternist.

Before vacating the important office of hon. secretary, Mr. Faulkner expressed his cordial thanks to all members for the wonderful support they had invariably given him; he asked for his successor a continuation of that support, or, better still, an even increased measure.

Election of Officers and Committee

The following were elected for the ensuing year:—*President*, Mr. A. J. Murphy; *senior vice-president*, Mr. G. R. Webster; *junior vice-president*, Mr. E. M. Currie; *hon. secretary and treasurer*, Mr. F. Arnold Wilson; *ordinary members of council*, Mr. Frank Hudson, Mr. D. Cherry Paterson and Mr. A. C. Turner; *branch representatives on general council*, Mr. F. H. Hoult, Mr. C. H. Kain, Mr. H. W. Lockwood, Mr. E. M. Currie and Mr. G. R. Webster; *branch representative on technical council*, Mr. A. Logan; *branch hon. auditors*, Mr. V. Delport and Mr. C. Cleaver.

A Tribute to Mr. Faulkner

In view of Mr. Faulkner's retirement from the office of branch hon. secretary and treasurer, his colleagues on the branch council presented to him an illuminated stamp album (which was of his own choosing) in appreciation of his many years of service. Soon after the last war Mr. Faulkner served for a number of years as hon. secretary of the branch. Subsequently he became branch-president, and later still, in 1926, president of the Institute. Then during the present war he has served again as hon. secretary and treasurer of the branch for five years. Reference to the presentation was made by his successor, Mr. F. Arnold Wilson, who paid tribute to his work, and read the inscription on the album, which was as follows:—"Presented to Vincent C. Faulkner by members of the London council of the Institute of British Foundrymen, in warm appreciation of his many years of valuable service to the London branch. 25th April, 1945."

Presentation of Diploma

The Institute's Diploma was presented to Mr. Ian Ross, of Slough, to whom it was awarded in respect of his Paper dealing with the production of a large magnesium casting. The branch-president, in making the presentation, said it was something of which one could be really proud, for it was awarded only in respect of Papers which really did enhance the science of the foundry.

MOULDING BOX MAINTENANCE

Mr. V. Elkington, managing director of the Dover Foundry Company, Limited, discussing moulding-box maintenance at the annual meeting of the London branch of the Institute of British Foundrymen, said he had found that by embedding a steel wire of about ¼-in. dia. in the material of the box, the breakages of boxes were reduced to a very low percentage and the distortion of the boxes was also reduced to a very considerable extent. He emphasised, however, that the wire must be absolutely clean, having no rust or anything of that sort. If one were producing in a closed mould, not an open sand mould, it was necessary to keep the top off the box until the last moment of casting, so that no steam or moisture would collect on the steel wire.

THE "NICKEL BULLETIN" for March contains abstracts dealing with the electrodeposition of silver, the relationship between yield stress and machinability, stress-corrosion cracking and soil corrosion. Copies may be obtained, free of charge, from the Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.

NEWS IN BRIEF

J. BROCKHOUSE & COMPANY, LIMITED, have opened an office in Manchester at Eagle House, 30, Cross Street, Manchester, 2.

THE AUSTIN MOTOR COMPANY, LIMITED, is to spend £1,000,000 on new machinery, production equipment and constructional work at its Longbridge factory.

THE DIRECTORS of the Blaenavon Company, Limited, propose to redeem 20 per cent. of the £375,464 5 per cent. mortgage debenture stock at the rate of 102 per cent., plus accrued interest.

SHORTAGE OF BOYS for industry was forecast by Mr. H. E. West, managing director of Newton Chambers & Company, Limited, Sheffield, when addressing the Institute of Industrial Administration in Leeds.

A GREATER POST-WAR DEMAND than ever for British goods, and especially for Sheffield goods, was forecast by Mr. C. E. Holmstrom, President of Sheffield Chamber of Commerce. Most firms, he said, had proof of this in the volume of export orders on their books waiting to be executed.

ARRANGEMENTS HAVE BEEN MADE between the United Steel Companies, Limited, and the Ministry of Supply for the purchase of the Chapel Bank Works, at Workington, Cumberland. It is intended to erect a foundry and to produce ingot moulds and other castings and general engineering requirements.

AEREX, LIMITED, previously a holding company, has now been broadened in character to concern itself in trading and has taken over the business of Aerex Fans, a branch of Colliery Engineering, Limited. This arrangement has in view extensions in fan developments, both in this country and overseas.

POST-WAR DEVELOPMENTS proposed by the Tyne Improvement Commission are estimated to cost £3,000,000. The Commission plans to recover trade lost through the war, especially with Scandinavia. Derelict sites adjoining the river are to be cleared and laid out with the intention of attracting new firms and businesses.

THE PRESIDENT OF THE BOARD OF TRADE has received a deputation which presented to him a claim on behalf of Sheffield and Rotherham for inclusion in the list of development areas to be prescribed in the Distribution of Industry Act. It was submitted that the experience of Sheffield and Rotherham during the inter-war years in respect of unemployment was such as to justify their inclusion in the list of places where there is a special danger of serious unemployment.

ACCORDING TO THE "Board of Trade Journal," since August, 1944, more than 1,300 applications have been received from manufacturers for the grant of facilities to enable them to carry out experimental and development work, including the manufacture of prototypes, in preparation for the switch-over to peacetime production. Of these 1,300 applications, only 13 have been rejected. Of the remainder, more than 1,150 have been approved and the rest are under consideration.

MR. DALTON, President of the Board of Trade, who has been touring South Wales, told Swansea Chamber of Commerce that the proposed tinplate plants would ensure a good and balanced distribution of industry in Wales. The Board of Trade would give priorities for the hot-strip mills at Port Talbot and push the work forward with all possible speed. The two cold-reduction plants near Llanelly and Swansea, and possibly a third in Monmouthshire, would fit in with geographical requirements.

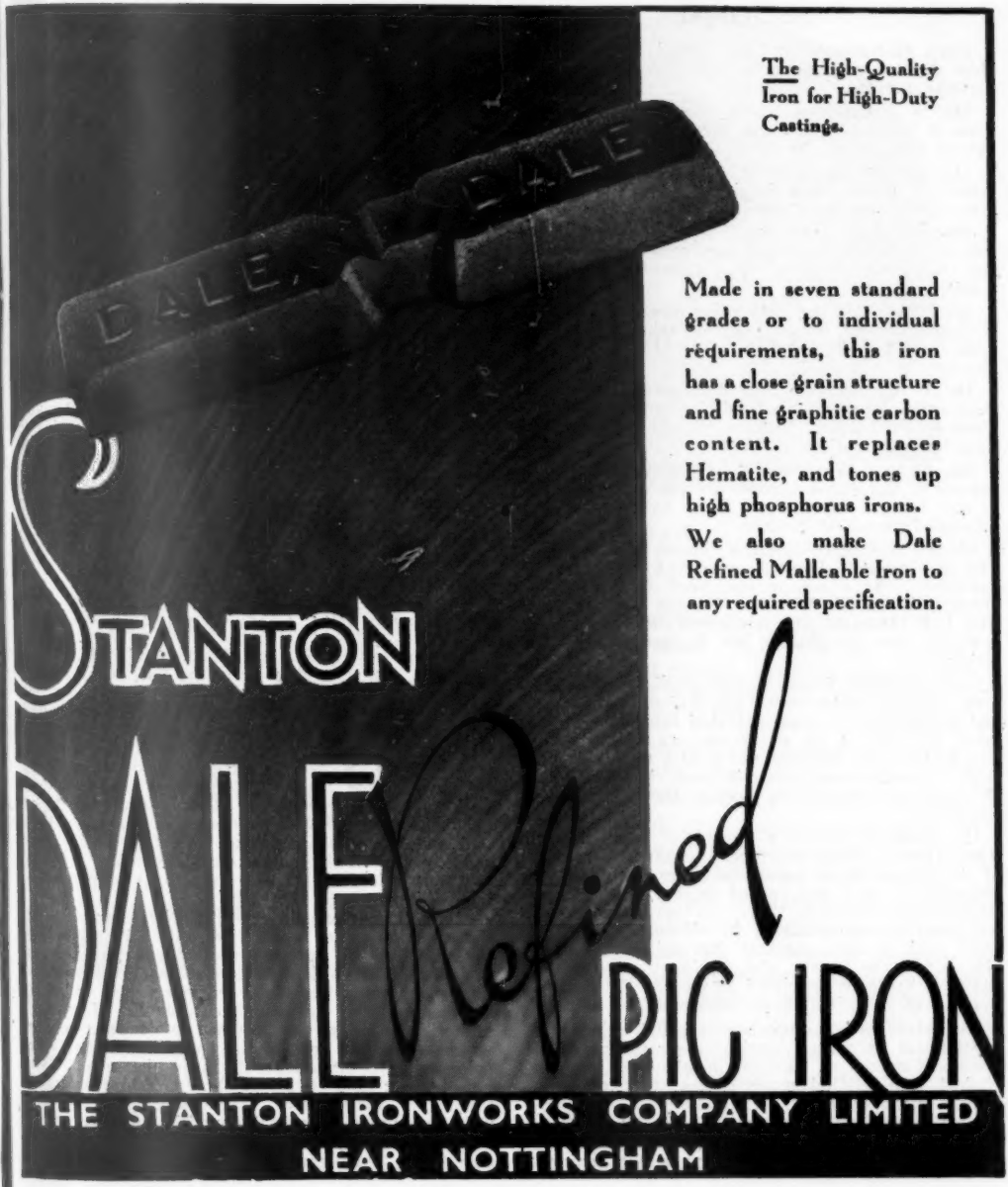
APPLICATIONS FOR ABOUT three million sq. ft. of production space in the Glasgow area have been received by the Board of Trade from manufacturers wishing to start peacetime production as soon as Government sanction can be obtained. Of that total, between a million and a million and a quarter sq. ft. of space has been asked for by 44 applicants wishing to engage in light industries. Six of the applicants are from the London area, while 38 are from Glasgow firms wishing either to extend their present businesses or set up new additional units.

THE DIRECTORS of the Crittall Manufacturing Company, Limited, announce that, in order to strengthen the company's capital position, it has been decided to redeem the whole outstanding 4½ per cent. first mortgage debenture stock on the first possible date—that is, January 2, 1946. It has also been decided to embark on a programme involving important capital outlay to ensure adequate supplies of raw material, which involves the provision of part of the finance required by the associated company, Darlington & Simpson Rolling Mills, Limited, for the erection of an additional rolling mill.

EDINBURGH TOWN COUNCIL have decided to oppose the Government's Distribution of Industry Bill, several members declaring that it would jeopardise the future prosperity of the city. The Council was unanimous in its opposition to the terms of the Bill under which Edinburgh is not to be regarded as a development area. Councillor Bell pointed out that Edinburgh's main industry, which was shipping and its many ancillary industries, could not be removed to other places, and Councillor Romanes said that within ten miles of the City Chambers lay a quarter of Scotland's undeveloped coal deposits.

KENT ALLOYS, LIMITED

Short Bros. (Rochester and Bedford), Limited, whose shares have been acquired by the Minister of Aircraft Production, owns all the shares in Kent Alloys, Limited, whose business comprises a non-ferrous foundry, equipped with modern plant and machinery, a machine shop, and chemical and X-ray laboratories. The board of Short Bros. have informed the Minister that the retention of control of this company is no longer essential for the efficient conduct of their business. With this view the Minister agrees, and he has accordingly authorised Short Bros. to make the shares of Kent Alloys, Limited, available for purchase by an approved buyer.


DALE
DALE
STANTON
DALE Refined PIG IRON
The High-Quality Iron for High-Duty Castings.
Made in seven standard grades or to individual requirements, this iron has a close grain structure and fine graphitic carbon content. It replaces Hematite, and tones up high phosphorus irons.
We also make Dale Refined Malleable Iron to any required specification.
THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM

PERSONAL

LORD MARGESSON has been elected a United Kingdom director of the International Nickel Company of Canada, Limited.

MR. A. J. CROCKER, works manager of C. A. Parsons & Company, Limited, Heaton, Newcastle, has retired after nearly 50 years' service.

MR. FRANK BROCKHOUSE has resigned from the board of Albion Drop Forgings, Limited. MR. J. R. BROCKHOUSE has been appointed to succeed him.

MR. WILLIAM CLARE, MR. EDWIN HALLAS and MR. THOMAS J. MAKIN have been appointed to the board of the Brightside Foundry & Engineering Company, Limited.

MR. D. G. MATHER, governing director of Mather & Smith, Limited, ironfounders, of Ashford, Kent, has been elected chairman of the Ashford Urban District Council.

MR. J. A. HOPKINSON and MR. LEWIS DAVIES have been appointed directors of the Neepsend Steel & Tool Corporation, Limited, Sheffield, of which hitherto they have been local directors.

MR. GEORGE WANSBROUGH has been elected chairman of A. Reyrolle & Company, Limited, in succession to Mr. Norbert Merz. COL. B. H. LEESON has been appointed managing director.

MR. D. H. GIMSON is still a director of Alfred Herbert & Company, Limited, machine-tool makers, of Coventry. In a note in our April 26 issue it was erroneously stated that Mr. Gimson had resigned. MR. J. H. MAHLER, who has joined the board of the company, took the place of MR. R. JACKSON, who had resigned.

CAPT. RICHARD DORMAN, son of Mr. Arthur Dorman, a director of Dorman, Long & Company, Limited, and president of the Iron and Steel Institute, who was taken prisoner in an attack on one of the Greek islands, has been liberated and is back in this country. Capt. Dorman was commissioned to the Green Howards and served with them at Dunkirk and elsewhere.

MR. JAMES H. ALLAN, a director of Smith & Wellstood, Limited, of Bonnybridge, who has been manager of the Dixon Street warehouse since he joined the company 57 years ago, retired on April 30. He was elected to the board in 1921. On the occasion of his retirement he was presented by his colleagues on the board with a silver cigarette box suitably inscribed. MR. W. PAULIN STOTT, the assistant manager in Glasgow, has been appointed to succeed Mr. Allan as manager of the Dixon Street warehouse.

MR. MATTHEW SEAMAN has recently resigned his appointment as general works superintendent of the Ironworks Branch of Newton Chambers & Company, Limited, and has taken up a new appointment as general manager of P. R. Jackson & Company, Limited, Manchester, a company in the David Brown group. Prior to joining Newton Chambers, Mr. Seaman was production superintendent at the Penistone works of David Brown & Sons (Huddersfield), Limited, whom he joined after a period as works manager of one of the factories of Ferranti, Limited, at Hollinwood, Lancs.

MR. F. ARNOLD WILSON, who has been elected honorary secretary and treasurer of the London branch of the Institute of British Foundrymen, was educated at Glasgow Academy, Sedburgh School and Christ's College, Cambridge, where he studied chemistry, geology and mineralogy. His studies were interrupted by the first world war, when he was commissioned as a second lieutenant in the 5th (T.F.) Battalion of the Cameronians (Scottish Rifles). He received the Mons Star, was mentioned in despatches, and was promoted to acting lieut.-colonel. The end of the war found him a pilot in the R.A.F. In 1919 he joined the firm of Pease & Partners, Limited, working in the foundry and blast-furnace departments. In 1920 he was appointed to the Glasgow house of William Jacks & Company, Limited, which was founded by his great-uncle, the late Dr. Jacks, LL.D., M.P. In 1921 he made an extensive tour of Canada and the U.S.A., studying the mining and metallurgical industries. Returning to Glasgow in 1922, he rejoined Wm. Jacks and transferred to the London house in 1925. He is now manager of the pig-iron department, a position which has involved extensive travelling on the Continent. During the present war he has been a captain in the Home Guard. He is nephew to Mr. F. P. Wilson, who presided over the Institute in 1930.

YOUTH AND INDUSTRY

In an address to Swansea Rotary Club, Mr. Arthur Whiteley, managing director of the Glanmor Foundry Company, Limited, Llanelly, said how serious was the decline in recruits in basic industries could be gauged by the fact that for every foundry apprentice obtained to-day three men in the trade became 60 years of age. Employers in the basic industries had not realised they had been losing a security. For too long had their basic industries been slums. Too little attention had been given to making conditions worth living. They had an apprenticeship scheme in South Wales sponsored by the Welsh Engineers' and Founders' Association, but little attention was given to its proper working.

Many firms were guilty of unhealthy competition by the exploitation of apprentices, Mr. Whiteley continued. Until this was stopped they would never teach boys their craft, which should not be part of production planning. The Welsh engineers and founders, members of the trade unions, and the educational authorities were getting together to devise a scheme which would take care of the anomalies. They were going to help the smaller firms in the area. They hoped to set up a system of apprenticeships separated from other works affairs. Several firms had offered to train young men from small foundries and engineering shops. Then they would be ready to go back to their own firms. Premium apprenticeships should cease.

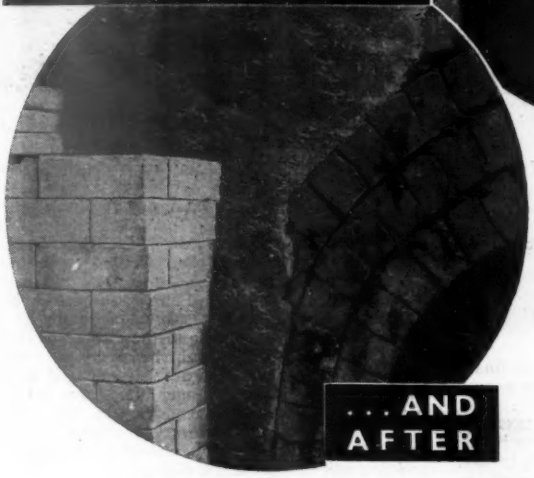
Patch

WORN FURNACE BRICKWORK WITH

Durax No. 1

PLASTIC FIREBRICK COMPOSITION

BEFORE



...AND AFTER

WHEN quick repairs to worn furnace brickwork are required, Durax No. 1 provides an excellent patching medium. It is supplied in a stiff, plastic condition ready for use. It possesses exceptionally high refractoriness, negligible shrinkage on drying, and good resistance to thermal shock.

Durax No. 1 is also frequently used as a rammed monolithic lining in small size furnaces, such as crucible furnaces, owing to the ease of installation — the avoidance of special shapes—and because it provides a strong, durable structure. Users who require further information concerning the uses of Durax No. 1 should communicate with the G.R. Technical Department.

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FIREBRICKS · BASIC BRICKS · ACID-PROOF MATERIALS · CEMENTS

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COMPANY RESULTS

(Figures for previous year in brackets.)

Broom & Wade—Interim dividend of 11¼%.

General Engineering (Radcliffe)—Net profit, after tax, £9,050 (£8,513); dividend of 20% (same).

E.N.V. Engineering—Profit, £81,723 (£81,469); final dividend of 10% (same) and a bonus of 8¾% (same).

John Summers & Sons—Dividends of 8½% (same) on the "A" stock and 4½% (same) on the "B" stock.

William Gray—Net profit for 1944, £29,990 (£35,069); dividend of 2% (same); forward, £10,138 (£10,148).

Bairds & Scottish Steel—Net profit for 1944, £90,135 (£87,408); dividend on the ordinary shares of 6% (same).

John Thompson Engineering Company—Final dividend of 12½%, plus a bonus of 5%, making 22½% (same).

Amalgamated Metal Corporation—Profit for the year to March 31 last, £210,814 (£212,617); ordinary dividend of 3½% (same).

Halesowen Steel Company—Net profit, £17,513; final dividend of 12½%, making 20% (25%); forward, £21,284 (£20,396).

G. Beaton & Son—Net profit for 1944, £12,629 (£12,683); dividend of 10% and a bonus of 5%, £7,500 (same); forward, £1,397 (£1,268).

Alfred Herbert—Profit to October 31, after tax, £601,644 (£634,959); dividend of 30% (40%), tax free; forward, £2,292,959 (£1,916,579).

C. & W. Walker—Profit to January 31 last, £9,211 (£8,261); deferred repairs, £2,305 (nil); dividend of 10% (same); forward, £17,839 (£17,235).

Heatrae—Net profit for the year ended February 28, after providing for taxation, £15,192 (£11,312); dividend of 12½% (same); forward, £7,500 (£7,368).

Babcock & Wilcox—Final dividend on the ordinary stock of 6% (same), making 10% (same), plus a cash bonus of 2% (1%), both less tax, at 9s. 8d.

R. W. Crabtree & Sons—Net profit, after taxation, £37,519 (£39,229); dividend of 8% (same), plus a bonus of 2% (same) from capital reserve not subject to tax.

Breedon & Cloud Hill Lime Works—Net profit to January 31, £22,141 (£20,877); dividend of 27½% (same); to general reserve, £5,000 (£10,000); forward, £8,004 (£7,191).

J. B. Brooks—Profit for 1944, after all charges, £16,940 (£16,202); to war contingencies reserve, £5,000 (same); ordinary dividend of 7% (same); forward, £18,916 (£16,476).

Metal Agencies Company—Profit after depreciation, £50,093 (£49,578); income-tax and N.D.C., £30,519; final dividend of 25%, making 28¾% (25%); forward, £12,237 (£11,588).

William Denny & Bros.—Net profit for 1944, £83,018 (£75,433); to general reserve, £40,000 (£35,000); ordinary dividend of 10% (same) and centenary dividend of 1¼% (nil); forward, £17,833 (£14,815).

J. W. Singer & Sons—Profit for the year ended January 31 last, after deducting debenture interest and providing for taxation, £7,069 (£8,309); ordinary dividend of 10% (same); forward, £27,604 (£29,318).

Llanelly Associated Tinplate—Trading profit for 1944, £70,110 (£55,069); additional trading profit for previous years, £19,526; war damage, £1,757; depreciation, £20,000 (same); tax and contingencies, £52,000 (£21,250); dividend of 2½% (same); forward, £41,824 (£39,256).

William Dixon—Net profit for the year to February 28, after providing for depreciation and taxation, £44,153 (£34,359); dividend on the 5% cumulative preference stock, less tax, £7,500; final dividend of 7½% (5%) on the ordinary stock, making 10% (7½%); forward, £37,116 (£33,263).

British Oxygen Company—Final ordinary dividend of 8%, making 16% (less tax at 9s. 8d.) for 1944, compared with 15% for 1943 (the 1943 interim was less tax at 9s. 6d. and the final less tax at 9s. 9¼d.); net profit for 1944, after charging depreciation, income-tax and E.P.T., £370,369 (£384,527).

OBITUARY

MR. E. R. SUTCLIFFE, founder and for many years managing director of Sutcliffe, Speakman & Company, Limited, engineers, of Leigh, Lancs, has died at Edenbridge, Kent, aged 70.

MR. WILLIAM ROYSE LYSAGHT, former chairman and managing director of John Lysaght, Limited, Newport, and for many years a leading figure in the steel industry, died at Chepstow, Monmouthshire, on April 27. He was 86 years of age. Mr. Lysaght was president of John Lysaght, having formerly been chairman and managing director. He was a director of Guest, Keen & Nettlefolds, Limited, and chairman of Joseph Sankey & Sons, Limited, and was on the boards of Bayliss Jones & Bayliss, Limited, and the Broken Hill Proprietary Company. Mr. Lysaght began his career in 1874, and claimed to have been actively engaged in the steel trade, as a principal, longer than any other living person. He became a magistrate, a D.L. for Monmouthshire, and an honorary freeman of Newport. In 1915 he served as High Sheriff of Monmouthshire, and in 1918 he was made C.B.E.

CONTRACTS OPEN

Any date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Birkenhead, May 18—2,125 yds. of 10-in. high-pressure gas main, for the Town Council. The Gas Engineer, Gas Offices, Hind Street, Birkenhead.

Calne, May 18—Providing and laying cast-iron water mains, for the Calne and Chippenham Rural District Council. Ross Hooper & Harvey, Dallas Chambers, Chippenham, Wilts. (Fee £1, returnable.)

Inverkeithing, May 15—Supplying and laying 480 yds. of 9-in. dia. spun-iron water main, for the Town Council. Mr. A. Forrest, burgh surveyor, Inverkeithing.

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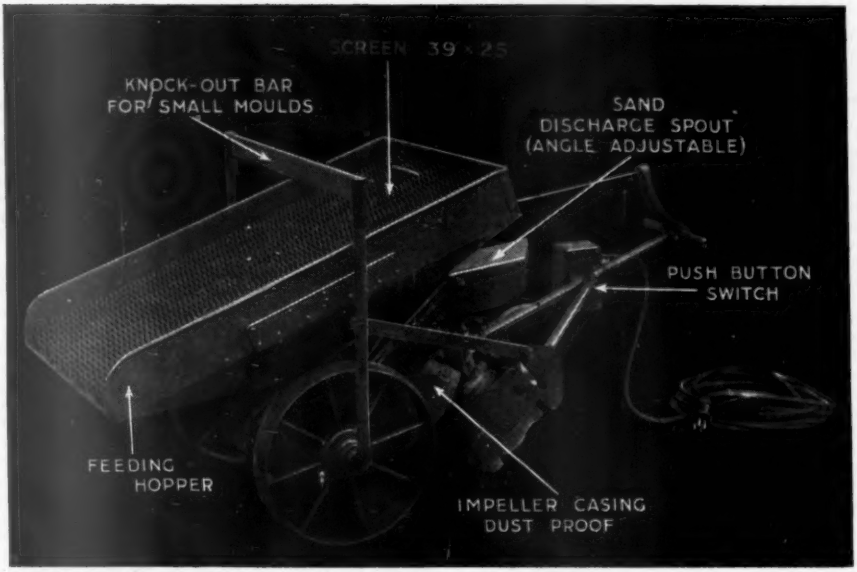

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Raw Material Markets

IRON AND STEEL

With organised enemy resistance in Europe declared officially at an end, manufacturers and fabricators of iron and steel look for something more real in the way of a change-over in industrial effort from wartime to peacetime pursuits than has been vouchsafed them so far. The manufacture of armaments and munitions, already greatly reduced, will be cut down still further now that fighting on the Continent of Europe has virtually ceased. So far relatively small quantities of iron and steel have been released to meet the huge pent-up demand for civilian products. In the foundry trade the stumbling blocks have been, first, labour, and secondly, pig-iron supplies. It may be expected that gradually more labour will be made available, but to increase the supply of pig-iron may be difficult, in view of the shortage of fuel. Coke, however, is now more freely available than it was during the winter months, and foundrymen hope that it will be possible to put additional furnaces into blast.

The further increase of 3s. 6d. in the price of coal will add to the cost of pig-iron making. Foundry-iron quotations have only just been raised by 15s. per ton, and possibly other financial expedients will be adopted to meet the new cost of fuel, but eventually the price level will have to be established on a truly economic basis. At the moment price levels throughout the iron and steel industry are largely artificial.

No change of any moment is so far apparent in connection with the pig-iron position as it affects the foundries. The general engineering and jobbing foundries are getting appreciable supplies of low- and medium-phosphorus pig-iron, and there appears to be no shortage of refined pig-iron, which foundries have been using for a considerable time in place of hematite. Recently, the hematite situation has shown some improvement, and it appears that more tonnage is being allocated for special needs, although more foundries would use this iron if they could get it.

In some districts the scrap situation is not at all easy, particularly as regards the heavy scrap wanted by the foundries. This applies to both heavy cast-iron and steel scrap.

In respect to the light foundry industry, supplies of high-phosphorus iron are not too easy, and licences are cut down to the minimum quantities, sufficient to keep the foundries going, but leaving no room for stocks. Practically all the current make is going direct to the foundries, which are reasonably busy, but only in relation to the labour available; all could do with more skilled hands. The general engineering foundries are not particularly active, except where they are engaged still on special Government work.

In recent weeks, improvements have been shown in the deliveries of limestone and ganister, and supplies of these materials are coming through reasonably well. Firebricks can also be obtained at fairly short notice.

The foundry coke situation is comfortable. Most districts are now "zoned," and specific tonnages have been allocated to the foundries from their normal sources of supply. The scheme appears to be working satisfactorily; at any rate, there are few complaints at the moment of any definite shortage, although the wagon situation is not at all easy. Following the increase in coal prices, it is almost certain that increased prices will also obtain for foundry coke, but no announcement has yet been made.

The demand for sheet bars is strong and persistent. Large supplies must be available to the sheet mills. Because of their heavily booked position, many of them are unable to accept any further business except for Period III. Although the rollers of bars and strip are not so heavily committed as the sheet makers, they are reasonably busy, and have been anxious for the last few weeks about billet supplies, which have not been forthcoming in the quantities required. In many cases the re-rollers are short of semis and their stocks are dwindling. For rollers in absolute need, the Control have released supplies from their very limited stocks of imported steel. The re-rollers, in order to eke out their "prime" billet position, are anxious to secure any other form of material for re-rolling, and steelworks have no difficulty in finding immediate outlets for defective billets or blooms, crops, defective rounds or squares, and the like.

NON-FERROUS METALS

There would appear to be ample supplies of copper, lead, zinc and aluminium available in this country, and the changing-over of factories to peacetime manufactures will not be delayed for want of metal. At the moment the trade is marking time. A certain amount of manufacturing capacity is being utilised to turn out goods that are in short supply, but there is almost unlimited scope for expansion. The labour shortage is the chief snag.

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